Diabetes and COVID 19 Update

Dealing with Challenges

the novel coronavirus, SARS-CoV-2

April 14, 2020

Carol Greenlee MD FACP

Take Care of Yourself

Care giving professionals are inclined to focus on others

Works in normal situations, but not when under stress

Care for yourself, so you can care for others

Sleep well, eat well, move, laugh

Plan for connection daily

Exhale with long slow breaths that calm body down (activates parasympathetic nervous system)

Treating others with **kindness and respect** is necessary for our ongoing health and safety.

We are all in this together.

Learning – and Adapting –on the Fly

- Epidemiologic/Surveillance data from other countries & US
  - ***Asymptomatic & Pre-symptomatic transmission***
- Lessons from other respiratory viruses – including MERS & SARS, influenza, RSV, etc.
- ***Case Reports***
- ***Frontline experience – challenges and suggestions***
  - Townhalls
  - Direct from the trenches
- ***Adapting management guidelines*** for supportive care & care of complications (***sick day management for diabetes,*** pneumonia, ARDS, AKI, thrombotic disorders, shock, etc.)

Preliminary US Data on Diabetes & COVID

- ~11% of people with COVID 19 had diabetes
  - ~42% of those with diabetes did not require hospitalization (home care)
    - (~84% with no underlying condition)
  - ~31% required hospitalization but not ICU (~7% with no underlying condition)
  - ~19% required ICU (~2% with no underlying condition)
  - ~31% of people who died from COVID 19 had diabetes
    - One study showed average A1c of those who survive 7.9% vs succumb 9.9%
- Most studies show that adults with **diabetes are no more likely to contract COVID-19** than people without diabetes, but they are **more likely to require ICU admission and to die from complications of the disease**
- The **number of co-morbidities** has been shown to be a significant **predictor of mortality –** includes obesity, HTN & smoking

Diabetes in the US – CDC (2017)

- Total: 34.2 million people have **diabetes** (10.5% of the US population - **13.0% of all US adults**)
  - Prevalence of diagnosed diabetes was highest among **American Indians/Alaska Natives (14.7%) – (23.5% of AI/NA adults)**
  - Unevenly distributed among communities - ranging from 1.5 to 33%
    - Lower SES and education level associated with higher % with diabetes
  - Increased with age **- 26.8%** of people **65 years or older** have diabetes
- ***21.4% of people with diabetes*** are **undiagnosed** (7.3 million people)
- Total: 88 million adults have **prediabetes** (34.5% of the US adults)
  - Only 15.3% of adults with prediabetes aware (**~85% unaware)** of their prediabetes status
  - **65 years or older**: 24.2 million have prediabetes

Vulnerabilities in PWD

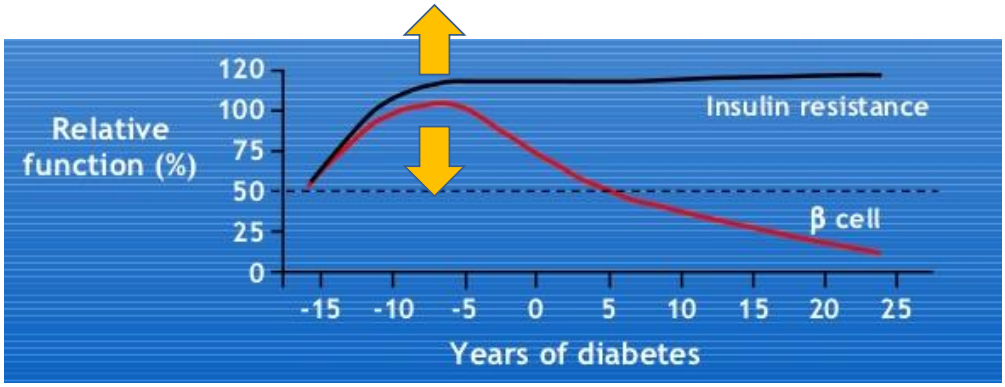
- 50.0% had an A1C value of 7.0% or higher
  - 22.3% had an A1C value of 7.0% to 7.9%
  - 13.2% had an A1C value of 8.0% to 9.0%
  - **14.6% had an A1C value higher than 9.0%**
  - **A1c level of 10% or higher**
    - 16.3% of adults aged 18–44 years
    - 12.7% of those aged 45–64 years and
    - **4.3% of those aged 65 years or older (high hypoglycemic risk)**
- Plasma glucose levels and DM are independent predictors for mortality and morbidity in patients with past SARS infections
  - Potential mechanisms that may increase the susceptibility for severe illness include ***blunted innate and adaptive immunity*** with ***accentuated inflammatory responses*** (hyperinflammation and cytokine storm syndrome)

Added Vulnerabilities for PWD

- 89.0% were overweight or had obesity,
  - 27.6% were overweight (BMI of 25.0 to 29.9 kg/m2)
  - **45.8%** had **obesity** (BMI of 30.0 to 39.9 kg/m2)
  - **15.5% had extreme obesity** (BMI of 40.0 kg/m2 or higher).
- 15% were current **smokers** – ***22.5% AI/NA***
- **68.4%** had **Hypertension** (High Blood Pressure)
- 37% had **chronic kidney disease** (stages 1 through 4)
  - < 25% with moderate to severe chronic kidney disease (stage 3 or 4) were aware of their condition - **>75% unaware/untreated**

Frontline Experiences

- Increased **severity** of presentation for **non-COVID illness**
  - New onset or exacerbation of chronic illness
  - Reluctance to go to Urgent Care/ED – ("where the virus is")
  - Not knowing how to reach care team during the crisis
- PWD with ***milder COVID 19 illness*** (**home**) – marked reduction in appetite – need for precautions to prevent both low & high blood glucose & dehydration
- **Severe hyperglycemia** on presentation to hospital for sicker patients
  - **Severe DKA** in ***type 1*** **&** ***type 2,*** including ***previously undiagnosed diabetes***
    - Challenges to treating DKA due to PPE and fluid restrictions for ARDS
  - **Severe hyperglycemia** (marked glucotoxicity) **& insulin resistance** in patients not previously requiring insulin (***Pre-DM, T2DM***) – occasional need for U500 insulin
  - High rates of **dehydration**
    - High rates of AKI/renal failure
  - Challenges to **BG checks** in ED /hospitalized patients (shortage of meters & PPE) -
    - Effects of high dose vitamin C on meter accuracy



Infection/Inflammation → increased Insulin Resistance (IR)

Markedly increased Insulin Requirements due to markedly increased IR

Need for B-cells to make more insulin (also impaired by inflammation)

If unable to secrete enough insulin → Increased blood glucose → ***Glucotoxicity*** → Increased IR & Reduced B-cell Insulin Secretion → **Severe Hyperglycemia and/or Diabetic Keto-Acidosis (DKA)** (preventable)

The best way to prevent illness from COVID 19 is to **avoid being exposed** to the virus

Critical importance of HC teams being proactive in **explaining** how to limit exposure

Make it Personal

Outreach & Details - Worth the Investment

- Be explicit and **provide details** (not just "you need to isolate", "you need to stay home") – people are needing clarity
  - The news/media is about *other* people, it is confusing, causes overload
  - Having someone explain what the PWD personally needs to do is a powerful form of caring
    - A plan helps create a sense of safety & efficacy (being effective) – sense of control
  - What we are asked to do/need to do is not easy, it is not natural, it is not automatic or obvious, it goes against human nature

  - Difficult to comprehend – ***"Our moral instincts have not been honed to guide us well in this extraordinary crisis. All of us are having trouble adjusting to a world in which leaving our own house for frivolous reasons carries the risk of manslaughter."***

    The Atlantic

IHS COVID-19 Resource webpage COVID-19 Patient Education Resources:

- What Tribal Members need to know about COVID-19 [PDF - 213 KB]
- How to Prevent the Spread of Coronavirus (COVID-19) in the Home [PDF - 2 MB]
- Elder Mental Health During COVID-19 [PDF - 3 MB]
- Tips for Elders and Their Caregivers [PDF - 376 KB]

- **Share simple facts about the COVID-19 outbreak, including symptoms, treatment, and effective strategies to reduce risk of infection in words older people can understand.**
  - Consider whether they have cognitive impairments when speaking about risk.
- Communicate instructions in a clear, concise, and respectful way.
  - Information may be displayed in writing or pictures.
- **Engage families with information** and help them practice prevention measures such as handwashing.
- **Contact elders via landline phones.**
  - Encourage family or friends to call their elders regularly and teach elders how to use video (chat).

Reach Out to Patient – *make it personal*

- Explain calling because want to be sure they have **a plan to stay safe**– they **personally have a high risk of serious illness if get sick** with COVID19 infection – help them avoid getting sick
  - What coronavirus / COVID 19 is – a virus – a type of germ – causes infection of lungs and can cause cough, fever, difficulty breathing
  - Very contagious – spreads from other people
  - People with diabetes [older age, other conditions] need to be especially careful since if this virus spreads to them, they could have a harder time fighting it off & could get very sick/ sicker than people who don't have diabetes [other conditions, younger] so the **best thing they can do is be extra careful to avoid/prevent getting sick**
- Review how to avoid/prevent exposure ("getting the virus"/ "getting sick")
  - How to protect themselves
  - How household members can help protect PWD (elders, other vulnerable persons with high-risk underlying conditions) from exposure

Best Scenario - Prevent Infection

The virus spreads through ***droplets*** that are produced when an infected person coughs or sneezes or even breathes/sings/speaks

- Person to Person spread ***through close contact*** is the *primary method of spread* - **advise to PWD**:
  - Put **distance** between yourself and other people – **avoid exposure**
    - **Stay home as much as possible –** not even medical clinic
      - Explain **remote medical care** - phone/tele-visits for medical care
        - **Call first** before Urgent Care or ED (unless 911 needed – call 911)
    - If possible, a **protected space** should be made available for vulnerable household members
    - Practice **social (physical) distancing** – 6 feet or more away from others
      - Avoid all non-essential visitors – enforce distancing as possible
      - **Barrier** of glass or plexiglass, etc. – door, windows, car window
      - Drive-up, outdoor delivery for grocery, foodbanks, etc. – **avoid direct hand-offs**
        - **"Walmart method"(items put in trunk or back of vehicle**) if possible or leave items outside if delivered

Best Scenario - Prevent Infection

- Person to Person spread ***through close contact*** is the *primary method of spread* - **advise to PWD**:
  - **Avoid all non-essential travel –** use mail or other delivery if possible
    - Have one (vs several) lower risk family/household member run essential errands & use pick-up services if possible (using the "Walmart" method)
  - **Avoid crowds/gatherings**, especially in poorly ventilated closed-in spaces, but even in outdoor spaces (crowded parks, walking/hiking trails, boat docks, etc.)
  - Request **job modification or excuse from work** if unable to work from home and if work poses increased risk of exposure
  - **Avoid close contact** with anyone with **symptoms or known COVID19**
    - Not being caregiver for exposed or sick family/household member
      - "Creative" caregiving that allows good physical distancing & cleansing if no other option
    - Not visiting sick family or friends (unless glass barrier such as window)
    - Caution with pets, especially from other households

Best Scenario - Prevent Infection

- Person to Person spread ***through close contact*** is the *primary method of spread* - advise to PWD:
  - **Cloth masks in public spaces** – ***intended to protect the other person,*** not the wearer, in case the wearer has ***asymptomatic or pre-symptomatic*** – still need as much **physical distancing** as possible – & **hand washing**
- Citing concern about **asymptomatic and pre-symptomatic spread** of COVID-19, the CDC recently recommended all Americans wear cloth masks in public
  - Prior studies found surgical masks help prevent dissemination of influenza virus, rhinovirus,
  - Study from South Korea compared patients with COVID19 patients **coughing** with **no mask, with a surgical mask, and with a cloth mask** –
  - Results suggest these **masks were ineffective at filtering SARS-CoV-2, presumably due to the small viral size** - **more virus on outside of mask than inside** –
    - didn't examine actual transmission of COVID-19 illness nor whether the masks "shorten the travel distance of droplets during coughing"
    - stressed need to **wash hands after touching mask**
  - **No data on** what happens with **speaking & breathing** vs coughing (***coughing is symptomatic – should be home and not going out regardless of mask***)

Best Scenario - Prevent Infection

- Person to Person spread ***through close contact*** is the *primary method of spread* - **advise to family & household members** of PWD [elders, other vulnerable persons]:
  - **Healthy family members in the household should conduct themselves as if they were a significant risk to the PWD, elder, etc.**
  - ***Avoid as much potential exposure to themselves*** as possible to protect the PWD, elder, etc. – ***stay home [or stay away] as much as possible***
    - If serving as the one person to run essential errands - reduce contacts
      - use delivery when possible
      - use pick-up with the items put in trunk/back of car
      - use barriers when available and appropriate
      - avoid direct hand-offs
    - Work from home if possible
    - Strict physical distancing & hand hygiene when out and returns home
    - Caution with pets - Carriers (cats?), animal fur, etc.

Best Scenario - Prevent Infection

Touching a surface covered in viral droplets & then touching your face can spread the virus (not primary means of spread)

For both PWD and family/household members

- To the extent possible, **avoid touching *high-touch surfaces in public places*** (elevator buttons, door handles, handrails) or ***handshaking***
  - Push doors with elbow or shoulder. Use a tissue or your sleeve to cover your hand or finger if you must touch something.
- **Wash your hands** after touching surfaces in public places.
  - **Best option: Soap & water** (soap damages the virus capsule, water temp not a factor) – at least 20 seconds – fingertips to wrist
  - If can't wash use **hand sanitizer** >60% alcohol x 20 sec
- **Avoid touching eyes, nose, mouth** (face)
- **Clean & disinfect "high touch surfaces" in personal spaces** (home, vehicle, etc.)
  - Tables, counters, rails, light switches, remotes, doorknobs, phone, keys, car door handles, steering wheel, etc.
  - Should remain wet 20-60 sec or more
  - CDC has list of disinfectants **(4 tsp bleach/one quart of water) (1/3 cup per gallon)**

Reach Out to Patient – *personal preparation*

- Be sure patient prepared to stay home & prepared in case of illness
  - Supplies for personal and diabetes care
    - **Food** – 2-week supply including items appropriate for sick day use (soup, etc.)
      - Examples of **sick day items** to have on hand: 6-pack of each regular and diet 7-Up or Sprite; 2 or 3 packets of regular and sugar-free Jell-O; Gatorade and broth
    - **Prescriptions and medical supplies** - at least 30 days - 90-days if possible
      - Extra insulin, glucose test strips and maybe urine ketone sticks (foil-wrapped)
  - Importance of monitoring blood sugars, taking meds, BG control
    - Exercise, sleep, healthy foods, hydration, stress reduction
  - ***Number to call*** if any issues with **diabetes** or other conditions
  - ***Number to call*** if any **symptoms suggestive of COVID 19**
    - Instructions on what to do if COVID symptoms – call ASAP
      - Increase SMBG and when to call regarding BGs
- Consider scheduling time for diabetes phone check up with CDE/clinician
  - **Explain how remote medical care will be delivered**

Getting the Job Done

- Ideas from the trenches – expand the team
  - **Use of sidelined staff & others for outreach** to patients
    - Cardiology practice using radiology staff to contact patients, explain need for precautions, teach how to use tele-visit technology before their tele-visit
    - FQHC using dental services staff to do patient outreach & education around precautions and remote care (how "appointments" will work – who calls who, etc.)
    - Public Health hot-line using retired firemen, retired deputies, EMT & MA students & others to explain/provide details how to avoid exposure, quarantine, isolation, etc.
    - Utilize Community Health Workers for outreach during the COVID19 crisis
  - Hand-off clinical issues to appropriate care team members
    - Needed prescriptions, medical questions or more detailed instructions
  - **Create a script & checklist** for those doing the outreach
  - E-mail/mail/text written info to patients/families -
    - IHS Division of Diabetes website resource - **Pictures of recommendations to prevent exposure, etc. – critical messaging**
      - Arrange for hand sanitizer and/or bleach solution if access to water is issue
    - **Phone numbers for help or what to do if no phone**
    - Lists & instructions for **diabetes sick-day prep** such as fluids & 15-gram carb items

COVID Crisis but Non-COVID illness
Diabetes Issues

- Encourage to take meds to stay healthy – to be in better shape to fight off the virus
  - If had been missing meds before – may need to reduce dosages ("diabetes camp effect") to avoid hypoglycemia (low blood sugar)
  - If physically active job but now "stay at home" – encourage outdoor activity but may need to increase meds and/or reduce food intake
  - Stress (anxiety, fear, loss, grief, etc.) can increase blood sugars
    - Resources to assist
  - Job loss, income loss, insurance loss → challenges to food, meds & supplies, housing, morale and more
    - If need to ration food, may need to reduce meds (stop SGLT2i med)
    - If can't get medication – options to offer to at least prevent severe hyperglycemia

Let them know you are available to provide help – **prevent** those **severe presentations of non-COVID illness**

Active Infection of PWD – concerns:

- Worsening of COVID 19
- Exacerbation of diabetes (blood sugar issues)
- Exacerbation of other chronic conditions (e.g. cardiac, respiratory, renal function)

Active Infection –– Concerns:

- Onset of COVID 19
  - Signs and symptoms of COVID 19, including mild respiratory symptoms and fever, develop on an **average of 5-6 days** after infection (the incubation period can vary in a wide range of between 1 to 14 days)
  - Published research indicates that COVID-19 presents initially with mild symptoms in the first week, which can include **fever**, **dry cough, fatigue, shortness of breath**, myalgia, sore throat, anosmia, nausea, or diarrhea *(nausea, vomiting & shortness of breath can also be sign of DKA)*
    - Guan et al. (Feb. 28 NEJM) found that **only 43.8% of the patients presented with fever** on admission, although fever developed in 88.7% during hospitalization
    - Fever & cough less common in elderly & immunocompromised – more often SOB at onset
    - Runny nose uncommon with COVID 19 – common with allergies

Active Infection in PWD

- Onset of COVID 19
  - If **patients feel they are developing symptoms** they should **call their health care team** – right away - don't go to UC or ED
    - Awareness for **monitoring** - critical
    - Ensure proper **isolation** (see previous)
    - Criteria for testing
  - *"Given the collective anxiety regarding the epidemic, even low-risk patients may benefit from **talking to their clinicians about symptoms, getting reassurance, and discussing an appropriate plan of care**."* NEJM March 27, 2020
  - Need to know **how to access care if symptoms worsen**
  - Help for stress, fear, anxiety – 1-800-985-5990

Active Infection in PWD:

- Worsening of COVID 19
  - The symptoms of the disease develop and change over time & **often *worsen as enters second week*** of infection
    - **Can worsen rapidly**, especially if immunocompromised etc.
  - **Severe and critical cases** can lead to severe pneumonia, respiratory failure, septic shock, and multiple organ dysfunction or failure.
  - In adults, **emergency warning signs** include:
    - Difficulty breathing or shortness of breath
    - Persistent pain or pressure in the chest
    - New confusion or inability to arouse
    - Bluish lips or face
    - Cold, clammy, pale, mottled skin
    - Little or no urine output
    - Coughing up blood
    - Neck stiffness
    - Escalating fever
  - If develop emergency warning signs for COVID-19 **get medical attention immediately** – ***call first*** to notify Clinic or ED
    - If possible, wear mask into the facility or prior to 911 arrival

Need for More Detailed Instructions & Formalized Monitoring

- …patients are reporting that they're **receiving vague directions** and varying responses as to **how they should follow up, and how often.**
- And there's a lot of **confusion around what "monitoring symptoms" means.**
  - That can be a real problem. While most people who have coronavirus have symptoms that can be managed at home, for a small part of the population, **when the disease escalates, it can escalate very fast.**
- **…some sort of formalized system** to **call and check in on potential coronavirus cases** and make sure they haven't crashed ***would fill a big need***.

Outpatient Risk Stratification for Patients with COVID19

More detailed outpatient risk stratification *Presence of risk factor in any category may upgrade risk

	Low Risk	Intermediate Risk	High risk
Symptoms	Mostly upper respiratory Mild cough NOT: short of breath	Cough Fever Mild shortness of breath	Shortness of breath Fever Severe or worsening cough
Risk Factors	Age <60 No underlying illness	Age 60-70 1 risk factor	Age>70 2 or more risk factors or single severe comorbidity
Social Factors	Able to self-isolate Anxiety, depression - provide resources where available	Able to self-isolate Uncertain/Unavailable caregiver	Able to self-isolate Caregiver available to provide support and monitoring
Disposition	Advise home care Strict return precautions Home quarantine precautions	Follow up virtual visit in 1-2 days with re-assessment per clinical judgement	Consider in-person, follow up virtual visit in 1 day, consider following daily for full 14 day course

All patients

- Quarantine instructions. See CDPHE website: https://covid19.colorado.gov/isolation-and-quarantine
- Counseling on expected course of disease including risk of double sickening
- Call back/ER precautions: any worsening symptoms, shortness of breath, new or worsening fever, chest pain

Risk Factors for Severe Disease*

- Age>60
- Immunosuppressed: transplant recipient, malignancy on chemotherapy, immunosuppressive treatment, HIV with +viral load
- Chronic Condition: HTN, diabetes, ESRD, COPD, Asthma, cirrhosis
- Pregnancy

*these risk factors are based on inpatient mortality data from China, Korea, New York

Infection in PWD –– concerns:

- Worsening of diabetes (blood sugar issues) - ***preventable/actionable***
  - Being ill can make it more difficult to manage diabetes.
    - **Hypoglycemia** - If a patient has severe malaise or loss of appetite or nausea/vomiting and is ***unable to eat,*** that can cause **glucose levels to fall** and/or **dehydration**
    - **Hyperglycemia** - Illness itself can increase insulin resistance and **raise blood glucose levels.**
      - **Increased insulin requirements** and/or **dehydration**
      - People with diabetes, **both type 1 and 2**, have a higher risk for **diabetic ketoacidosis (DKA)** when ill with a viral infection –– that can make it harder to avoid sepsis and septic shock (impaired immune function, electrolyte and fluid imbalance)

Infection in PWD – Worsening of diabetes
or if not sick but limited food intake

- **Hypoglycemia** – usually due to ***reduced food intake***
  - Check blood sugar more often – instruct based on risk
  - **Stop SGLT2i** (at first sign of illness and/or reduced food intake)
    - Can take 3-4 days for effect to wane (increased stress & starvation ketosis)
  - May need to reduce or stop sulfonylureas
  - May need to reduce insulin
  - Treat low blood sugar - *need to know how to treat low BG before it happens*
    - Rapid glucose
      - If low (blood sugar below 70 mg/dl or target range), eat 15 grams of simple carbs that are easy to digest like glucose tabs, honey, jam, Jell-O, hard candy, popsicles, juice or regular soda, and re-check BG in 15 minutes to make sure levels are rising.
    - Glucagon rescue – sick day use
      - Kit
      - Pre-filled syringe
      - Nasal

Meal Planning on Sick Days

If able to eat meals

- Eat usual meals
- Drink **eight (8) ounces** of ***calorie-free extra fluids each hour*** throughout the day
- Examples:
  - water
  - tea
  - broth
  - diet soda
  - sugar-free Jell-O

If not able to eat usual meals

- Try eating or drinking food or beverage items with ***15 grams carbohydrate*** **every hour** (see list next slide)
- Continue to drink ***extra calorie-free fluids*** in between

Foods/Fluids that contain 15 grams of Carbohydrate

- 1/2 cup apple juice
- 1/2 cup regular soft drink (caffeine-free)
- 1 double-stick popsicle
- 1/4 cup regular pudding
- 1 slice dry toast
- 1/2 cup cooked cereal
- 6 saltine crackers
- 1 cup soup
- 1/3 cup frozen yogurt
- 1 cup Gatorade
- 1/2 cup regular ice cream
- 1/4 cup sherbet
- Milkshake (1/3 cup low fat milk and 1/4 cup ice cream)
- 1/2 cup regular gelatin/Jell-O
- 1 cup nonfat, sugar-free yogurt (not frozen)

Maintain Hydration

- **Eight ounces (8 oz) of fluid each hour**
  - If not eating can add in fluids containing carbs
    - e.g. 4 oz Regular Sprite + 4 oz Diet Sprite or 8 oz Gatorade
- ***Every third hour,*** consume eight ounces **(8 oz)** of a **sodium-rich choice such as bouillon**
- If having trouble keeping fluids down, ***have small sips every 15 minutes or so throughout the day to avoid dehydration***
- Recommend ***good hydration (calorie-free fluids) as part of staying healthy*** (avoid going into COVID illness with underlying dehydration)

Infection in PWD – Worsening of diabetes:

- **Hyperglycemia** & higher risk for **diabetic ketoacidosis (DKA)** when ill with a viral infection
  - Patients who are feeling sick need to **monitor their glucose more frequently** – even every 2 to 4 hours if /while blood sugar is elevated
  - They should **continue taking their diabetes medications**, ***unless instructed otherwise*** by their providers
    - Based on what we know about risk of DKA with ketogenic diet and surgical stress with SGLT2i meds – **stop SGLT2i**
    - if **patient is sick – at first sign of illness** (3-4 days for effect to wear off)
      - May then need to **add Insulin** to control blood glucose levels
    - if **unable to eat** or not sick but **needing to ration food**
      - May or may not need an alternative diabetes med – closely monitor
    - If **patient on both insulin and SGLT2i,** and gets sick, unable to eat or needs to limit food due to shortage → **STOP the SGLT2i first before reduce or stop insulin**
      - if reduce/stop the insulin and not the SGLT2i then much higher **risk for DKA** during stress of illness or reduced carb intake

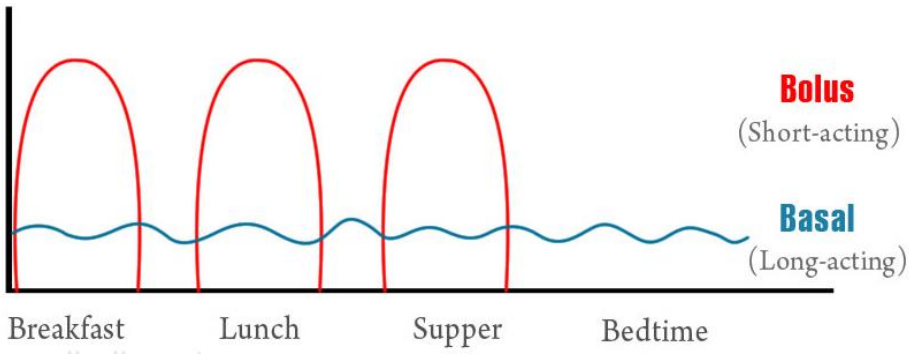
Infection in PWD – preventing high BGs/DKA:

- **Preventing severe hyperglycemia / DKA**
  - If sick & reduced intake, N/V/D, – stop Metformin, GLP1-RA
  - May need to **add "sick day" insulin**
    - ***Adjust Basal Insulin & add "correction insulin"*** for current users
    - **Instructing patients *new to insulin*** – consider
      - Use pens, if possible, for simplicity
      - Tele-video visit to instruct and help monitor/adjust if possible
      - Phone call to instruct & monitor/adjust
        - if possible, use you-tube (several available) as visual aid
      - Car visit --- instructions provided from outside with patient/caregiver in car (window up – use phone if possible) – then monitor by phone
      - Brainstorm and share ideas
    - **Calculating Insulin doses in patients *new to insulin***
      - ***Basal Insulin & Correction Insulin***

Basal Insulin – suppresses glucose production between meals & overnight to maintain blood glucose in normal range when not eating - ~ 50% of daily needs

Bolus (mealtime, prandial) Insulin – limits hyperglycemia after meals – 10 to 20% of total daily insulin requirement as rapid-acting insulin at each meal – should ***hold if NPO or not eating***

Correction Insulin – ***extra rapid-acting insulin given for high blood glucose*** to reduce BG to target range



Infection in PWD – preventing high BGs/DKA:

- **Adding "sick day" insulin** (can also use in hospital on ward)
  - Calculate **starting doses of insulin**
    - 0.5-0.7u/kg = Starting Total Daily Dose or
    - 0.25u x weight in pounds = Starting Total Daily Dose
    - E.g. 100 kg patient = 50 - 70 units or 220 pounds = 55 units
  - Start with ½ as **Basal Insulin** - e.g. 25-35 units insulin glargine
    - If patient sick & has increased insulin resistance ***may need to rapidly increase dose*** - need to monitor & **adjust based on FBS** –
      - Call with patient daily or algorithm for patient/caregiver
      - Start with 20% increase if BG in 200s, 30% increase if BGs in 300s
        - May need to double dose or even more if severe insulin resistance
      - With insulin glargine – split dose to BID if > 50u per injection
      - Can use NPH BID (some are doing q8hour during COVID19)
        - 50% AM and 50% PM if not eating (e.g. start at 15u BID for 100 kg pt)
        - 2/3 AM and 1/3 PM if eating

Infection in PWD – preventing high BGs/DKA:

- **Adding "sick day" insulin** (can also use in hospital on ward)
  - Calculate **starting doses of insulin**
    - 0.5-0.7u/kg = Starting Total Daily Dose or
    - 0.25u x weight in pounds = Starting Total Daily Dose
    - E.g. 100 kg patient = 50 - 70 units or 220 pounds = 55 units
  - **Bolus (mealtime) Insulin** - if eating meals add 10-20% of starting dose as rapid-acting insulin with each meal – ***hold if not eating***
    - e.g. 5-10 units before each meal if use 50 units at starting total dose for 100 kg patient
    - More refined methods in extra slides added to end of slide deck (recovery stage)
  - **Correction Insulin** - Intended to ***decrease BG*** levels to target range – based on patient's "sensitivity or correction factor" -can be used to:
    - add more insulin to a mealtime bolus to correct for a high premeal blood glucose
      - e.g. take 5 units if BG 80-140, 6u (5u+1u) if 141-170, 7u (5u+2u) if 171-200, etc.
    - **Used alone to correct a high blood glucose outside of mealtime or if NPO**

Quick "cheat sheet" for Correction Factor(CF)/Sensitivity Factor(SF)

CF based on patient weight

- <60 lb. = 100
- 60—80 lb. = 75
- 81—100 lb. = 60
- 101—120 lb. = 50
- 121—140 lb. = 45
- 141—170 lb. = 40
- 171—200 lb. = 30
- 201—230 lb. = 25
- 231—270 lb. = 20
- >270 lb. = 15

If patient on insulin
Use 1700/TDD*

Or calculate by using
3000/weight in Kg

e.g. 3000/100kg=30
1u should reduce BG
by 30 points

The CF = the mg/dl drop in BG caused by 1 unit of insulin
Depends on sensitivity to insulin - weight, age renal function

The right correction dose will return the BG to within 30 mg/dl of the target blood glucose about 3-4 hours after the dose is injected

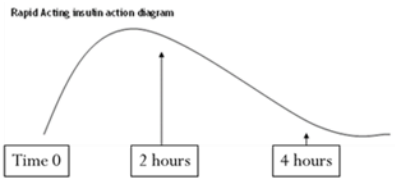
With severe IR, may need to go to "stronger" correction dose by using smaller CF (SF) e.g. 30→ 25→20→ 15
This gives **more insulin** as the correction dose of insulin

$$\frac{\text{Current BG - Target BG}}{\text{CF}} = \text{Correction Dose}$$

Guide for Using Correction Insulin

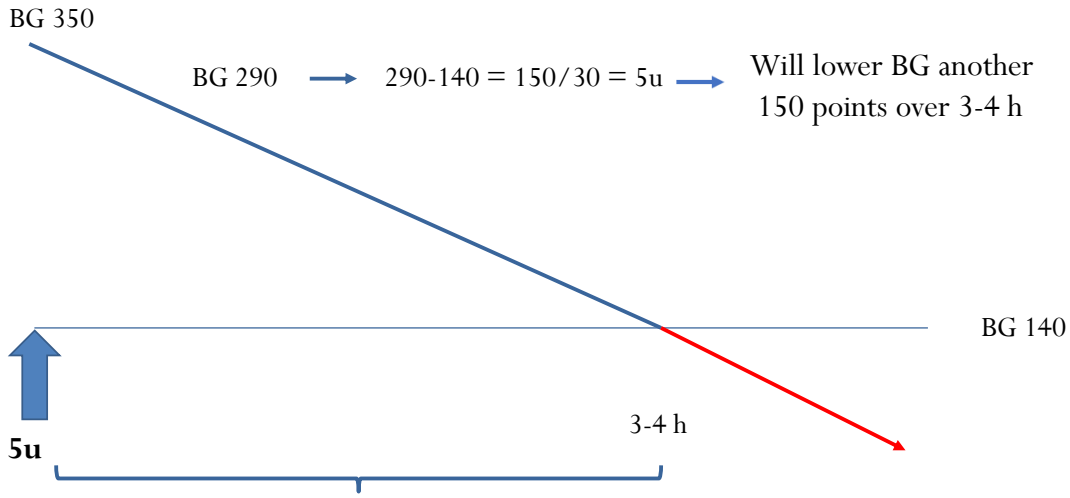
- During illness aim for blood glucose in **110-180 range**
  - if high risk of low BG aim for 140-180 range
- Example of Correction dose calculation for CF 30
  - **[current BG-target BG/CF]** – e.g. Current BG is 350 and target is ~140
  - 350-140/30 = 210/30 = 7u correction dose of rapid acting insulin
  - Can give patient a **correction scale**: e.g. for BG 180-210 1u; BG 211-240 2u; BG 241-270 3u, 271-300 4u, BG 301-330 5u, etc.
  - To strengthen: 210/25= 8u; 210/20 = 10.5u; 210/15 = 14u *(see extra slides)

- Only give **Correction Insulin**
  - every ***3-4 hours for analog insulin*** –
  - every ***4-6 hours for Regular insulin*** –
  - otherwise end up **"stacking" insulin** and risk of low BG
    - Explain it takes Fast Insulin 3-4 hours to **finish working**



"Stacking" Correction Doses

Correction dose: 350-140 =210/30 = 7 units



7u will lower BG 210 points over 3-4 hours

Glucose Meter Issues in the COVID Crisis

- Challenges to blood glucose monitoring
  - Due to PPE resource conservation – reduced opportunity for poc glucose checks in hospitalized patients
    - Need to bundle or cohort testing with other needs to enter room (3-4x per day)
  - Shortage of hospital glucometers in some settings
  - Suggestion by many (requires relaxation of hospital regulations) is to have **patient bring their home glucose meter & strips** with them to ED/hospital – can check their own BG and can help staff

- Be aware - high dose vitamin C being used by some patients to Rx COVID19 via social media recommendations - interferes with glucose oxidase-based test strips – falsely high readings

Provide PWD with a Personal Plan to Protect

- Prevent exposure – make it personal – "it's about you"
- Prepare – needed supplies, phone numbers, instructions
- Plan – an anchor in uncertainty
- Proactive care of diabetes if patient develops COVID 19 –
  - help prevent
    - low blood sugar
    - dehydration
    - Hyperglycemia, glucotoxicity and/or DKA
  - monitoring of diabetes & COVID19
- Creativity required – this is not business as usual – be open to using new and/or different approaches, resources, personnel

"Start where you are. Use what you have. Do what you can." A. Ashe

Sharing Ideas & Resources

https://www.acponline.org/clinical-information/clinical-resources-products/coronavirus-disease-2019-covid-19-information-for-internists

"We have learned that the community makes a difference.
The most positive message that I can bring to you is that this shock has made blossom the best of the spirit of society, and that makes us much more powerful, much stronger."

Italian physician

cgreenlee@westslopeendo.com

Extra Slides

Safer Arrivals and Departures to and from Work During COVID-19

Before work

- Eat well, drink well
- Come to work without belts, jewelry, and anything that cannot be high temperature washed at home every night
- Come to work clean shaven and without make-up
- Protect your skin with hand cream that is free of irritants like retinol or those labeled "anti-aging." And consider fragrance-free products with dimethicone, polyuronic acid or shea butter

At work

- Change into clean scrubs upon arrival and leave your street clothes in a non-patient care area
- Clean your hands and wear a procedural mask in patient care areas
- Avoid touching your face and minimize unnecessary contact with equipment, door handles, keyboards, etc.
- Clean your hands often
- Stay 6 feet from other people during work, breaks, and meals
- Check in with your team often
- Change scrubs after interactions with patients that may have led to contact with droplets or other bodily fluids
- Follow PPE guidance for donning and doffing
- Clean your hands before leaving a patient care area, and remove scrubs before leaving
- Sanitize your stethoscope, badge, pager, etc.
- Shower at work, if possible
- Leave your scrubs in the designated bin
- Leave in your street clothes

At home

- Leave your shoes outside
- Shower before interacting with anyone if you didn't at work
- Wash everything you wore to work at high temperature
- Limit screen time
- Get outside for sunshine
- Eat well, drink well
- Sleep

Correction Scales for different Correction Factors

- **CF 50:** for BG 180-230 give 1u; 231-280 2u; 281-330 3u; 331-380 4u; 381-410 5u; 411-460 6u; 461-510 7u, etc.
- **CF 40:** for BG 180-220 give 1u; 221-260 2u; 261-300 3u, 301-340 4u, 341-380 5u, 381-420 6u, 421-460 7u, 461-500 8u, 501-540 9u, etc.
- **CF 30:** for BG 180-210 give 1u; 211-240 2u; 241-270 3u; 271-300 4u; 301-330 5u; 331-360 6u; 361-390 7u; 391-420 8u; 421-450 9u, etc.
- **CF 25:** for BG 175-200 give 1u; 201-225 2u; 226-250 3u; 251-275 4u; 276-300 5u; 301-325 6u; 326-350 7u; 351-375 8u; 376-400 9u, etc.
- **CF 20:** for BG 180-200 1u; 201-220 2u; 221-240 3u; 241-260 4u, etc. OR
  - BG 180-220 give 2u; 221-260 4u; 261-300 6u, 301-340 8u, 341-380 10u, 381-420 12u, 421-460 14u, 461-500 18u, 501-540 18u, etc.

Correction Bolus (Supplement)

- Must determine the decrease in glucose from 1 unit of rapid-acting insulin
- This number is known as the correction factor (CF)
- Use the 1700 rule or weight to estimate the CF
- CF = 1700 divided by the total daily dose (TDD)

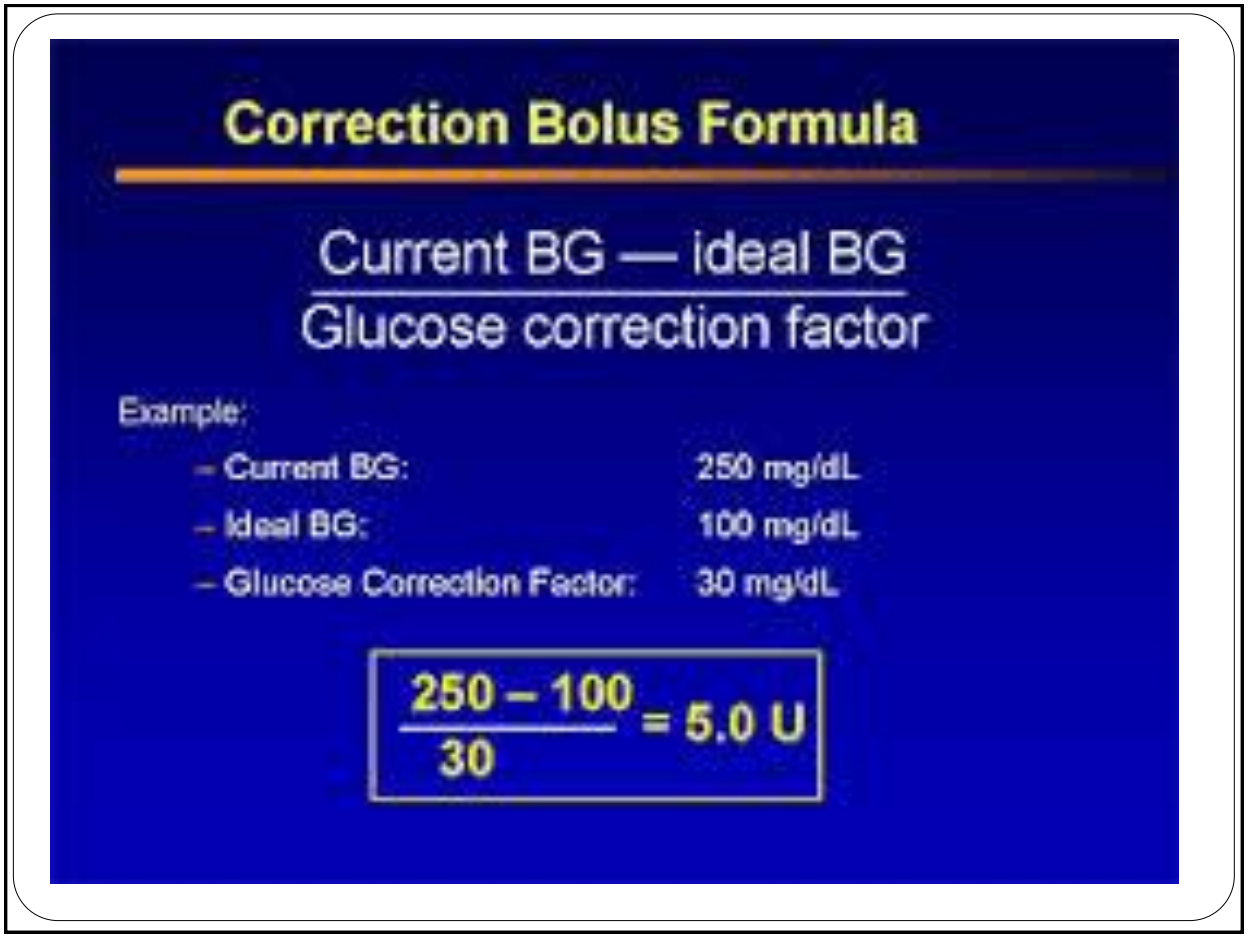
  (eg. if TDD = 50 units, then CF = 1700/50 = ~30, meaning 1 unit of glucose will lower the BG ~30 mg/dL)
- CF = 3000 divided by weight in kg

1700 Rule* to Calculate the Sensitivity Factor

- Divide: 1700 by Total Daily Insulin to estimate the Sensitivity Factor (SF) /Correction Factor (CF)
  - Example: 14 units basal insulin + 16 units bolus insulin = 30 units total daily insulin
  - 1700/30 = 50.
- This Correction Factor means that 1 unit of insulin will lower blood glucose by approximately 50mg/dl.
- HOW TO USE THE CORRECTION FACTOR TO CALCULATE A CORRECTION DOSE:
- **Correction Dose Formula**:
  - (Current BG) - (Target BG)/CF = Correction dose
  - Example: Current BG = 200 mg/dl, Target BG = 100 mg/dl, Correction Factor or Sensitivity Factor = 50
  - So, 200-100/50 = 100/50 = 2.0 units of insulin for a Correction dose
- If numeracy / math challenged: provide **range**
  - e.g. 151-200 - 1unit; 201-250 - 2units, 251-300 – 3units, 301-350-4u, etc

*Alternative Methods for Estimating the Sensitivity Factor

- Some Health-care professionals use the “1500 rule” to calculate insulin sensitivity factor for people who use Regular (short-acting) insulin. The 1500 rule works as follows: Divide 1500 by the total daily dose of insulin, in units.
- Some HCPs use the “1800 rule” to calculate insulin sensitivity factor for people who use the rapid-acting insulin analogs lispro (brand name Humalog), aspart (NovoLog), and glulisine (Apidra).


Correction Bolus Formula
Current BG — ideal BG
Glucose correction factor
Example:
– Current BG: 250 mg/dL
– Ideal BG: 100 mg/dL
– Glucose Correction Factor: 30 mg/dL
250 – 100 / 30 = 5.0 U

Covering Meal Carbs

- The **insulin-to-carb ratio (ICR)** is a way to get the right amount of insulin for the carbohydrates in a meal (or snack) –
  - it means the patient will take ***1 unit of insulin for a certain amount of carbohydrate***
  - Even if eating **fixed amounts of carb** at a meal – need to have appropriate ICR for the **fixed meal insulin dose**
- E.g. - If the insulin-to-carb ratio (ICR) is 1 unit of insulin for every 10 grams of carbohydrate (written 1:10) - will take 1 unit of insulin for every 10 grams of carbohydrate eaten – if eat 60 grams will take 6 units
  - If ICR is 1:15 – will take 1 unit for every 15 grams of carb eaten
    - If eat 60 grams of Carb will take 4 units
  - For fixed meal doses – e.g. patient eats ~45 grams of carb each meal and weighs ~120# with estimated ICR of 1:15 - will take 3 units with each meal
  - Or if patient eats 30g Carb with Breakfast, 45 grams with Lunch & 60 grams with Dinner – would take 2u with B, 3u with L and 4 units with D

Estimating an Insulin to Carb Ratio

Based on Total Daily Dose

- 8—11 units 1:50
- 12—14 units 1:40
- 15—18 units 1:30
- 19—21 units 1:25
- 22—27 units 1:20
- 28—35 units 1:15
- 36—45 units 1:12
- 46—55 units 1:10
- 56—65 units 1:8
- 66—80 units 1:6
- 81—120 units 1:5
- >120 units 1:4

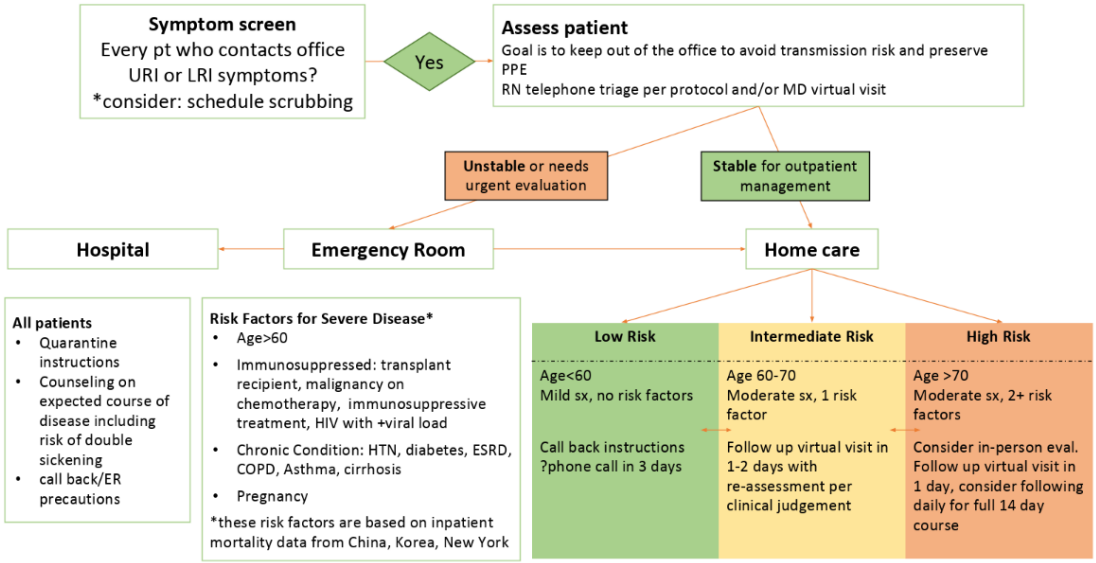
Based on the 500 Rule

Based on Body Weight

- <60 lb. 1:30
- 60—80 lb. 1:25
- 81—100 lb. 1:20
- 101—120 lb. 1:18
- 121—140 lb. 1:15
- 141—170 lb. 1:12
- 171—200 lb. 1:10
- 201—230 lb. 1:8
- 231—270 lb. 1:6
- >270 lb. 1:5

Fails to consider body composition & insulin resistance

A proposed COVID19 management pathway



Preliminary US Data on COVID 19

" [Early US] results are consistent with findings from China and Italy, which suggest that **patients with underlying health conditions and risk factors** might be at **higher risk for severe disease or death** from COVID-19"

- 37.7% of people with COVID 19 had 1 or more underlying health condition
  - ~52% care at home (non-hospitalized) (~84% no underlying condition)
  - ~29% required hospitalization (~7%)
  - ~13% required ICU admission (~2%)
    - Ventilation: ~50% recover vs ~80% with influenza
  - 94% of reported deaths were in patients with at least one underlying condition.

COVID-NET

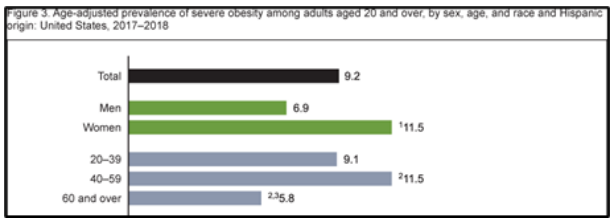
- Created to conduct **population-based surveillance** for laboratory-confirmed COVID-19 **using the existing infrastructure** of the Influenza and RSV **Hospitalization Surveillance** Networks
- Clinical data on **COVID-19–associated hospitalizations** (patients admitted during March 1–30, 2020)
  - Elevated rates among **older adults** (65 and over)
  - Majority have **underlying medical conditions** - the most common were
    - hypertension (49.7%)
    - obesity (48.3%)
    - chronic lung disease (34.6%)
    - diabetes mellitus (28.3%)
    - cardiovascular disease (27.8%)

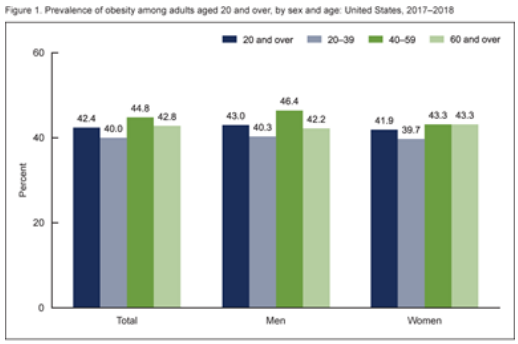
Assessing Risk- A Warning about Obesity

France's chief epidemiologist, Professor Jean-François Delfraissy, warned

- "*This virus is terrible, it can hit young people, in particular obese young people. Those who are overweight really need to be careful.*"
  - France: ~25% obesity rate

- 42.4% of US adults have obesity – across all age groups of adults
  - 48.1% of American Indian/Alaska Native adults (over 18)
- 9.2% of US adults have severe obesity





Indian Health Service
Division of Diabetes Treatment and Prevention

- **People with diabetes who are infected with the coronavirus are more likely to develop severe coronavirus disease (COVID-19) and complications.**
  - They **should be especially diligent to reduce risk of exposure**, including hand washing, practicing social distancing, and staying home as much as possible.
- **Managing diabetes** can be more challenging during this time.
  - **Blood sugars:** activity restriction, changes in eating patterns, and illness can all affect blood sugars. Patients should monitor more closely and call their health care team if they are having problems.
  - **Medications:** patients should ensure they have sufficient medications and call their health care team if they need refills.
- To reduce the risk of coronavirus exposure, **avoid going to the clinic unless necessary**.
  - Patients who develop **mild symptoms** should monitor their blood sugars, stay well hydrated, and call their health care team with concerns.
  - For **severe symptoms**, seek medical care right away.